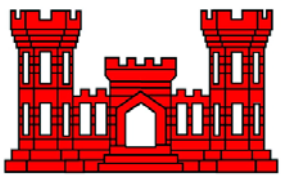
Appendix E
Part 5

Section 404(b)(1) Evaluation Report



U.S. Army Corps of Engineers
Memphis District

DRAFT

SECTION 404(B)(1) EVALUATION REPORT

ST. JOHNS BAYOU - NEW MADRID FLOODWAY PROJECT
NEW MADRID, MISSISSIPPI, AND SCOTT COUNTIES, MISSOURI

I. Introduction

This evaluation of compliance with the Clean Water Act, 40 CFR Part 230 – Section 404(b)(1) Guidelines (Guidelines) relies on the detailed information in the draft environmental impact statement (EIS) to which it is attached and is not intended to be a "stand alone" document.

The purpose of these Guidelines is to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material. Generally, dredged or fill material should not be discharged into aquatic ecosystems, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.

The procedures for documenting compliance with the Guidelines include the following:

- Examining practicable alternatives to the proposed discharge that might have fewer adverse environmental impacts, including not discharging into a water of the U.S. or discharging into an alternative aquatic site.
- Evaluating the potential short- and long-term effects, including cumulative effects, of a proposed discharge of dredged or fill material on the physical, chemical and biological components of aquatic environments.
- Identifying appropriate and practicable measures to mitigate the unavoidable adverse environmental impacts of the proposed discharge.
- Making and documenting the Finding of Compliance required by §230.12 of the Guidelines.

The Tentatively Selected Plan (TSP), Alternative 3.1, construct and operate flood control improvements in both the St. Johns Bayou Basin and New Madrid Floodway, with seasonal flood pulse management and measures to avoid and minimize environmental impact, will be evaluated for compliance. Alternative 3.1 is the least environmentally damaging practicable alternative (LEDPA).[1]

II. Project Description

a. Location. The St. Johns Bayou Basin and New Madrid Floodway are located in Mississippi, New Madrid, and Scott Counties in southeast Missouri (Figure 1). The New Madrid Floodway setback levee separates the two basins and prevents Mississippi River water from

[1] As this is a draft document, USACE invites public comment on the analyses and conclusions. Should the selected alternative change in the final environmental impact statement, this 404(b)(1) analysis will be revised to evaluate that alternative for compliance under the Guidelines.

flooding the St. Johns Bayou Basin. The frontline levee forms the eastern boundary of the New Madrid Floodway, but a 1,500-foot gap between the setback levee and the frontline levee allows Mississippi River water to back up into the floodway, causing backwater flooding.

The St. Johns Bayou Basin is approximately 324,170 acres (507 square miles) in size, extending north to Commerce, Missouri, east to East Prairie, Missouri, and south to New Madrid, Missouri. Major streams and ditches include St. Johns Bayou, Setback Levee Ditch, St. James Ditch, St. Johns Ditch, Lee Rowe Ditch, and Maple Slough Ditch. All of these ditches flow into St. Johns Bayou, and, via the St. Johns Bayou outlet structure, empty into the Mississippi River.

The New Madrid Floodway is approximately 132,600 acres (207 square miles) in size, beginning just south of Cairo, Illinois, and extending south to New Madrid. Major streams and ditches include Mud Ditch, Wilkerson Ditch, St. Johns Diversion Ditch, Tenmile Pond, and St. James Bayou. St. James Bayou and the other ditches flow into Mud Ditch, which passes through the 1,500-foot gap, converges with St. Johns Bayou, and empties into the Mississippi River about one-half mile east of New Madrid. Additional information can be found in Section 3 of the draft EIS.

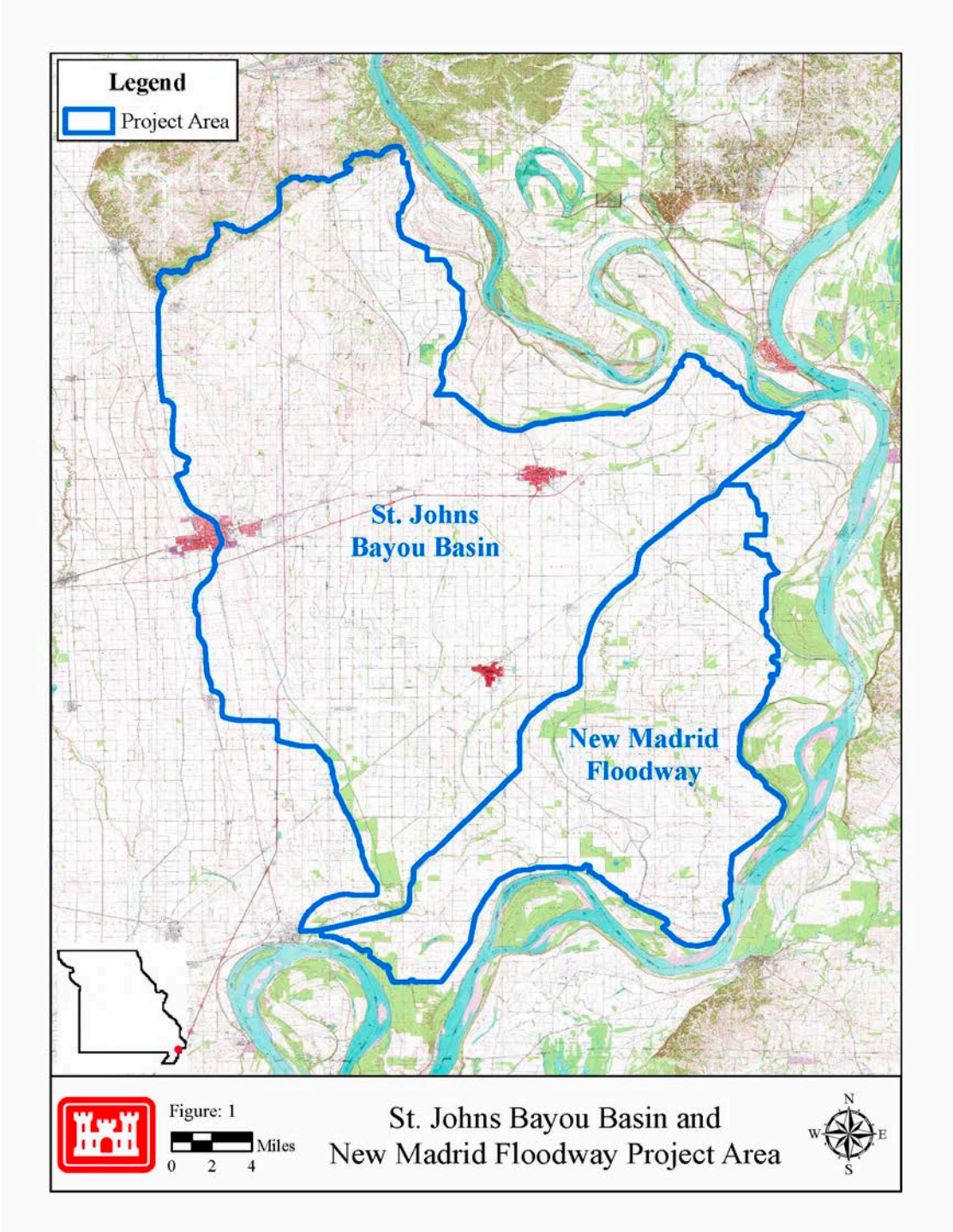
The purpose and need of this project as directed by Congressional mandate is for USACE to reduce the likelihood and adverse effects—on agricultural and urban lands—of backwater and headwater flooding in the New Madrid Floodway and in the St. Johns Bayou Basin. The endstate authorized by Congress in both the Flood Control Act of 1954 and in the Water Resources Development Act of 1986 was closure of the 1,500 foot gap in New Madrid Floodway as well as channel clearing, enlargement, and modifications in the two basins as well as a floodwater pumping plant in both basins, as well as other environmental and recreational features. Through various studies described in Section 1 of the draft EIS, the authorized project has been further refined and modified to incorporate avoid and minimize measures, but the overall project purpose to improve the means and methods of preventing and controlling destructive floodwaters has remained the same.

b. General Description.

1) Existing Conditions. In the St. Johns Bayou Basin, the existing gravity outlet structure at the lower end of St. Johns Bayou prevents Mississippi River backwater flooding. Floodgates in the six 10-foot by 10-foot concrete box culverts remain open under normal conditions to provide drainage through the New Madrid Floodway setback levee; the conveyance has a maximum capacity of 10,000 cubic feet per second (cfs). The floodgates are manually closed during periods of high water in the river. When the river level is lower, in elevation, than the level of St. Johns Bayou, the floodgates remain open and St. Johns Bayou flows naturally into the Mississippi. During periods of high water in the Mississippi River, the floodgates are closed, which impounds St. Johns Bayou and causes it to back-up in the basin, inundating lower-lying areas. This kind of flooding, though less severe than backwater flooding from the Mississippi, can be extensive and is exacerbated by rainfall. The 2-year flood floodplain in the St. Johns Bayou Basin reaches an elevation of 291 feet[2], flooding approximately 11,904 acres, of which approximately 60 percent are devoted to agricultural production. Flooding in the New Madrid

[2] Elevation is expressed in terms of number of feet above sea level, as calculated using a recognized datum.

Floodway most frequently occurs when the Mississippi River rises in the spring. As the Mississippi River rises, it backs up into the New Madrid Floodway through the 1,500-foot gap, inundating low-lying areas until the river recedes. The 2-year floodplain in the New Madrid Floodway reaches an elevation of 292.1 feet, inundating approximately 33,391 acres, of which approximately 74 percent are devoted to agricultural production.



Over time, and especially as the result of levee construction, the project area has undergone dramatic anthropogenic modification. What once was an expansive bottomland hardwood forest (BLH) ecosystem has been converted into a mostly homogenous landscape of agricultural fields. Conversion of wetlands to cropland is well documented as a leading cause of wetlands loss in the United States (Dahl and Allord, 1997).

The U.S. Army Corps of Engineers (USACE) estimates that 86 percent of the wetlands historically present in the project area have been lost due to conversion to cropland. Further, natural drainage systems have been replaced by a vast network of ditches and drainage structures designed to drain low-lying areas to make them agriculturally productive. While some reaches of larger ditches have some riparian buffer, most project area ditches have little to no buffer and are farmed to top bank. Intensive soybean and corn farming operations, coupled with a lack of protective buffers capable of retaining sediments and nutrients, result in the project area being a large contributor to nutrients in the Mississippi River. Robertson, et al (2009) determined with ≥90 percent certainty that the area was ranked in the top 15 watersheds (out of 818) for nitrogen and phosphorous contribution to the Gulf of Mexico, and concluded that the highest total nitrogen (TN) yields closely coincide with areas of intense agricultural production.

To ensure that the number of acres of wetlands would not be underestimated, USACE assumed that vegetated areas, of all types listed in the National Land Cover Database (NLCD), that lie within the existing 5-year floodplain are wetlands. Using this assumption, 5,233 acres of wetlands exist within the St. Johns Bayou Basin and 8,807 acres of wetlands exist within the New Madrid Floodway. Adding wetlands forecasted to be enrolled in the Wetlands Reserve program (WRP), the total in the St. Johns Bayou Basin rises to 6,678 acres and the total in the New Madrid Floodway rises to 9,572 acres.

The acreage of farmland falling under Clean Water Act jurisdiction was established from Natural Resource Conservation Service (NRCS) estimates of farmed wetlands (lands that are wetlands) and prior converted cropland (lands that are not wetlands). NRCS calculated that 1,098 acres of farmed wetlands are located within the project area (792 acres in the St. Johns Bayou Basin and 306 acres in the New Madrid Floodway, respectively). Additional information can be found in Section 3 of the draft EIS and Appendix E, Part 1.

2) Recommended Plan. The tentatively selected plan (TSP), alternative 3.1, combines the congressionally-authorized project (alternative 2.3) with measures to lessen environmental impacts, including smaller channel enlargements in the St. Johns Bayou Basin and modifying operation of the proposed-to-be-constructed outlet structure in the New Madrid Floodway closure levee, to permit backwater flooding in the New Madrid Floodway to an elevation of 289.5 feet. A full description of alterative 3.1 can be found in Section 2 of the draft EIS.

The measures to lessen environmental impacts were formulated from the findings and recommendations of an Independent External Peer Review (IEPR) panel, public scoping, inter-agency coordination, and previous environmental impact assessments. Tables 1 and 2 provide preliminary flood control alternatives and project objectives considered. Section 2 of the draft EIS describes the process by which alternatives were formulated, screened, and the range of alternatives subsequently established.

Table 1. St. Johns Bayou Basin preliminary alternatives and project objectives.

Measure	Reduce Community Isolation	Reduce Agricultural Flood Damages	Reduce Street and Road Flood Damages	Retain for Screening
St. Johns Bayou Pumping Station	X	X	X	Y
St. Johns Bayou Ditch Modifications	X	X	X	Y
East Prairie Ring Levee			X	Y
St. Johns Bayou Fish and Wildlife Refuge		X		N
St. Johns Bayou Expanded Fish and Wildlife Refuge		X		Y
St. Johns Bayou Agriculture to Silviculture		X		Y
St. Johns Bayou Crop Conversion		X		Y
St. Johns Bayou Nutrient Trading				N
St. Johns Bayou Relocations	X			Y
St. Johns Bayou Raise Roads	X			Y

Table 2. New Madrid Floodway preliminary alternatives and project objectives.

Measure	Reduce Community Isolation	Reduce Agricultural Flood Damages	Reduce Street and Road Flood Damages	Retain for Screening
New Madrid Floodway Authorized Closure Levee	X	X	X	Y
New Madrid Floodway Alternate Levee Locations	X	X	X	Y
New Madrid Floodway Pumping Station	X	X	X	Y
New Madrid Floodway Fish and Wildlife Refuge		X		N
New Madrid Floodway Expanded Fish and Wildlife Refuge		X		Y
New Madrid Floodway Agriculture to Silviculture		X		Y
New Madrid Floodway Crop Conversion		X		Y
New Madrid Floodway Nutrient Trading				N
New Madrid Floodway Relocations	X			Y
New Madrid Floodway Raise Roads	X			Y

Eight alternatives were carried forward for detailed analysis. They include:

• Alternative 1: no action;

• Alternative 2.1: construct and operate flood control improvements in the St. Johns Bayou Basin only;

• Alternative 2.2: construct and operate flood control improvements in the New Madrid Floodway only;

• Alternative 2.3: construct and operate flood control improvements in both the St. Johns Bayou Basin and New Madrid Floodway;

• Alternative 3.1: construct and operate flood control improvements in both the St. Johns Bayou Basin and New Madrid Floodway, with seasonal flood pulse management and measures to avoid and minimize environmental impact;

• Alternative 3.2: construct and operate flood control improvements in both the St. Johns Bayou Basin and New Madrid Floodway, with seasonal flood pulse management affording greater springtime flood protection and measures to avoid and minimize environmental impact;

• Alternative 4.1: construct and operate flood control improvements in both the St. Johns Bayou Basin and New Madrid Floodway, with floodplain connectivity maintained up to an elevation of 289.5 feet in the New Madrid Floodway and measures to avoid and minimize environmental impact; and

• Alternative 4.2: construct and operate flood control improvements in both the St. Johns Bayou Basin and New Madrid Floodway, with floodplain connectivity in the New Madrid Floodway maintained up to an elevation of 289.5 feet, reforestation of agricultural lands below an elevation of 289.5 feet, and measures to avoid and minimize environmental impact.

As noted, alternative 3.1 has been identified as the TSP. It would provide the greatest net excess economic benefit[3] while reducing environmental impacts compared to the congressionally-authorized project (alternative 2.3). In addition, alternative 3.1 contributes to social well-being by reducing flooding that inundates roads and isolates residential communities.

The elements of alternative 3.1 are:

- Close the 1,500-foot gap in the New Madrid Floodway by constructing a levee. The levee would be constructed of 233,000 cubic yards of earth and have a crown-height elevation of 317.0 feet, a top width of 16 feet, a base width of approximately 302 feet, and side slopes of 4.5:1.
- Construct in the closure levee four gated, 10-foot by 10-foot box culverts as an outlet for Mud Ditch. The gates would be closed only to prevent backwater flooding and to maintain sufficient impounded water in winter to inundate lands for waterfowl habitat.
- Raise the lower section of the New Madrid Floodway frontline levee to an equivalent crown-height elevation of 317.0 feet. This would require approximately 127,000 cubic yards of material. The levee would be substantially similar in dimension as the closure levee.
- Raise the crown-height elevation along 14.1 miles of the New Madrid Floodway setback levee. It is anticipated that 2.4 million cubic yards of material would be required. No changes to base width are proposed. Therefore, construction would be entirely confined to the existing levee footprint.
- Construct a 1,500-cfs pump in the New Madrid Floodway at or near the location of the Mud Ditch outlet structure.
- Modify St. Johns Bayou Basin streams and ditches as follows:
    - 3.7 miles of the lower St. Johns Bayou would be enlarged from one side to a bottom width of 120 feet. Approximately 856,770 cubic yards of material would be deposited along the bank and would re-vegetate naturally. Conservation easements would be purchased to ensure this benefit.

[3] Excess benefits are calculated as the total annualized dollars in expected benefit minus the cost of the investment, which is distinguished from return on investment or benefit to cost ratio.

- The lower 8.1 miles of Setback Levee Ditch would be enlarged from 40 feet to 50 feet along the left descending bank. Approximately 675,000 cubic yards of material would be placed in a 120-foot wide embankment and allowed to re-vegetate naturally as part of a conservation easement.
- The lower 3.5 miles of St. James Ditch would be enlarged along the left descending bank by increasing the bottom width from 35 feet to 45 feet. The remaining 7.8 miles of channel work would increase the top bank width to 80 feet. Approximately 630,000 cubic yards of excavated material would be placed in a 100-foot wide buffer along the left descending bank.

- Construct a 1,000 cfs pumping station in the St. Johns Bayou Basin.
- Maintain the current scheme of operations for the St. Johns Bayou gravity outlet structure (*i.e.,* close gates to prevent backwater flooding).
- Impound water in the St. Johns Bayou Basin to an elevation of 285.0 feet, for the benefit of waterfowl, by closing the St. Johns Bayou outlet structure from 1 December to 31 January.

c. Authority and Purpose. Authority to build and operate the St. Johns Bayou and New Madrid Floodway Project is granted by section 203 of the Flood Control Act of 1954 and section 401(a) of the Water Resources Development Act of 1986. As prescribed by Congress, the purpose of the proposed project is to reduce the likelihood and effects of flood-related damage, disruption, and dislocation in the project area by improving the means and methods of preventing and controlling destructive floodwaters. Additional information can be found in Section 1 of the draft EIS.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material. Dredged and fill material consists of sediment and other matter to be removed from streams and ditches; four gated, 10-foot by 10-foot concrete box culverts to be placed in the New Madrid Floodway closure levee as an outlet for Mud Ditch; material used to construct transverse dikes and hard points at selected ditch confluence areas; and, earthen material used to construct the New Madrid Floodway closure levee. Soils within the drainage ditches in St. Johns Bayou Basin consist primarily of silts, clays, and sands deposited by the Mississippi River.

(2) Quantity of Material. A combined total of approximately 3.79 million cubic yards of material would be removed from St. Johns Bayou Basin ditches and placed along the banks of St. Johns Bayou, Setback Levee Ditch, and St. James Ditch. Approximately 233,000 cubic yards of material would be utilized for the New Madrid Floodway closure levee, to be located between the New Madrid Floodway setback levee mile 35 and 37.

(3) Source of Material. Approximately 447 acres of borrow pits, located in prior converted cropland in the lower portions of the St. Johns Bayou Basin and New Madrid Floodway, would be used as sources of material for the New Madrid Floodway closure levee and for raising the lower portion of the New Madrid Floodway frontline levee.

e. Description of the Proposed Discharge Site(s)

(1) Location. The project area is located in New Madrid, Mississippi, and Scott Counties in southeast Missouri (Figure 1). Additional information can be found in Section 1 of the draft EIS.

(2) Size. The New Madrid Floodway closure levee would occupy an area of approximately 9 acres. The placement of fill material along ditch banks in the St. Johns Bayou Basin would cover an area of approximately 84.9 acres along St. Johns Bayou, of 222 acres along Setback Levee Ditch, and of 102.3 acres along St. James Ditch.

(3) Type of Site/Habitat. A typical ditch in the project area consists of a straight, trapezoidal channel with a relatively flat, uniform bed devoid of substantial bar structures. Additional information can be found in Section 3.0 of the draft EIS. Other sites and habitats likely to be affected by the proposed fill activities are a mix of vegetated wetlands, agricultural areas (prior converted cropland and farmed wetlands), and WRP areas. Prior converted cropland constitutes a significant portion of the affected acreage. The remaining areas may experience modest decreases in function due to projected hydrologic changes in the project area.

(4) Timing and Duration. The timing and duration of construction is subject to the appropriation and availability of funds.

f. Description of Disposal Method. Various types of mechanical equipment (e.g., bulldozers and excavators) would be utilized to excavate, transport, and place material at the locations described.

II. Factual Determinations

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope. The proposed box culvert in Mud Ditch would not impact ditch substrate elevation or slope. Channel enlargement reaches would result in channel deepening. Additional information regarding channel enlargement can be found in Section 4 of the draft EIS.

(2) Sediment Type. Sediments are comprised of a mixture of sand, silt, and clay.

(3) Dredged/Fill Material Movement. No foreseeable movement of dredge/fill material would be expected. Best management practices, such as silt fences, would be utilized during construction. In addition, the establishment of woody and grass riparian buffer strips would provide excellent erosion control.

(4) Physical Effects on Benthos. The effects on benthos are described in Section 4 of the draft EIS. Dredge/fill operations would physically remove much of the benthos within the

construction footprint. Re-colonization of the benthic zone would be expected to take place within a limited period of time.

(5) Other Effects. Additional effects, including indirect impacts associated with changes to flood frequency and duration are described in Section 4.0 of the draft EIS.

(6) Actions Taken to Minimize Impacts. Alternative 3.1 incorporates several avoid and minimize measures which reduce environmental impacts compared to the authorized project. The lower 3.7 miles of St. Johns Bayou would be excavated from the right descending bank only (channel enlargement typically involves excavation of both banks) and the proposed bottom width increase would be reduced from 200 feet to 120 feet. Excavated material would be placed in the project right-of-way along the right descending bank and would be allowed to re-vegetate naturally.

Setback Levee Ditch would be enlarged from one side (left descending bank) only. Therefore, existing riparian vegetation on the right descending bank would be preserved. Setback Levee Ditch previously had a high concentration of mussels along the right descending bank. However, based on recent surveys, this is no longer the case. Regardless, the right descending bank would be avoided. Therefore, this area would remain intact in case mussels re-colonize.

Rights-of-way along St. James Ditch would alternate sides to protect areas of riparian vegetation (*i.e.*, spoil material would be side-cast, where practical, into prior converted cropland (as opposed to vegetated areas)).

In addition to reducing direct impacts by enlarging channels from one side only, USACE proposes to implement a 40-foot grass buffer strip on one bank as an environmental design feature. Although grass buffers do not provide shade to the level of woody vegetation, in agricultural regions, grassy areas may be more effective in reducing bank erosion and trapping suspended sediments than wooded areas (Lyons 2000). In fact, Castle et al. (1994) reported that grass buffer strips as narrow as 15 feet trapped approximately 90 percent of NH_4-N, NO_3-N and PO_4-P, and that trapping efficiencies increased to between 96 percent and 99.9 percent when the buffer width was increased to 30 feet. Wolf (2009) also noted that switchgrass provides excellent erosion control when used as filter strips, grass hedges, or cover on levee banks.

The approximately 447 acres of borrow pits needed for fill material would be ecologically designed to benefit floodplain fisheries, as well as provide wetlands habitat.

In order to minimize impacts associated with closing the New Madrid Floodway, backwater flooding would be allowed up to prescribed elevations by leaving the to-be-constructed Mud Ditch outlet structure gates open, thereby maintaining a degree of connectivity with the Mississippi River that otherwise would be lost. Additional information can be found in Section 2 of the draft EIS.

b. Water Circulation, Fluctuation, and Salinity Determinations

(1) Water. The effects of material export vary considerably among the constituents of interest and between the two project areas, compared to what would likely occur were the authorized project not constructed and operated. Within the New Madrid Floodway, net average export of total phosphorus (TP) would be reduced by about 15-20 percent by alternative 3.1. However, in the St. Johns Bayou Basin, alternative 3.1 would cause little effect on TP export compared to what likely would occur were the authorized project not constructed and operated. Likewise, total nitrogen (TN) export associated with alternative 3.1 showed no discernible influence compared to alternative 2.1 in the St. Johns Bayou Basin, but in the New Madrid Floodway, alternative 3.1 would reduce average nitrogen export by about 15 percent compared to existing conditions. Likewise, implementation of alternative 3.1 in the St. Johns Bayou Basin would have little influence on organic carbon export, but in the New Madrid Floodway, alternative 3.1 reduces organic carbon export by about 40 percent compared to existing conditions. The pattern of sediment is similar to carbon. Alternative 3.1 has little influence on sediment export from the St. Johns Bayou Basin, but reduces sediment export from the New Madrid Floodway by about half.

(a) Salinity. Due to the location of the project area, salinity issues are not applicable.

(b) Water Chemistry. Water quality analysis conducted concludes that no expected change in water chemistry would result from project implementation.

(c) Clarity. No change in water clarity would be expected by implementation of the TSP.

(d) Color. No change in water color would be expected by implementation of the TSP.

(e) Odor. No change in water odor would be expected by implementation of the TSP.

(f) Taste. The ditches and bayou are not currently used as a municipal water supply, nor are they expected to be used as such. Therefore, the effect of project implementation on water taste is not applicable.

(g) Dissolved Gas Levels. No change would be expected in dissolved gas levels by implementation of the TSP.

(h) Nutrients. Aside from the water quality benefits described above, no change is expected in water nutrients by implementation of the TSP.

(i) Eutrophication. No change would be expected in eutrophication by implementation of the TSP.

(j) Others as Appropriate. Existing ditches undergo routine maintenance consisting of vegetation and sediment removal. Therefore, there is a limited amount of shade found in the ditches. Enlarging ditches would further remove the limited amount of stream bank vegetation and shade provided, which would increase water surface area. Both of these will cause some elevation of water temperature in the waterways. This effect is being minimized by working from one bank and leaving the vegetative cover on the other. In addition, material deposited along the banks of streams would be allowed to re-vegetate and remain as a conservation easement. Furthermore, the proposed vegetative riparian buffers would be expected to reduce sediment and nutrient loads from adjacent agricultural fields.

(2) Current Patterns and Circulation

(a) Current Patterns and Flow. It is anticipated that enlargement of ditches would increase flow capacity.

Although construction of the closure levee and box culverts would not alter flow during most of the year during non-flood stages, closure of the 1,500-foot gap in the Frontline Levee would limit the amount of flooding in the New Madrid Floodway. Additional information regarding project impacts can be found in Section 4 of the draft EIS.

(b) Velocity. Enlarging ditches would be expected to reduce channel roughness. Therefore, water velocity would be increased. However, mitigation features such as transverse dikes would be expected to provide a sinuous low flow channel and reduce velocity.

(c) Stratification. No stratification would occur in ditches beyond that which may normally take place under existing conditions.

(d) Hydrologic Regime. The hydrologic regime would be modified in the New Madrid Floodway. Additional information regarding project impacts to hydrological regimes can be found in Section 4 of the draft EIS.

(3) Normal Water Level Fluctuations. No changes to water fluctuation patterns are anticipated during non-flood periods. Closure of the levee and pumping stations would modify water level fluctuations. Further information is found in Section 4 of the draft EIS.

(4) Salinity Gradients. Due to the location of the project area, salinity issues are not applicable.

(5) Actions That Would Be Taken to Minimize Impacts. To minimize impacts associated with closing the New Madrid Floodway gap, a level of connectivity between the floodway and the Mississippi River would remain by allowing backwater flooding to reach prescribed elevations prior to closing the gates in the proposed Mud Ditch outlet structure,

operating the proposed pumping station, or both. Additional information can be found in Section 2 of the draft EIS.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. No long term significant increase in suspended particulate levels or extended periods of turbidity would be expected. Discharge activities would increase turbidity during construction but return shortly thereafter to preconstruction levels.

(2) Effects on Chemical and Physical Properties of the Water Column.

(a) Light penetration. Excavation activities within ditches would temporarily increase turbidity within these waterways, thereby temporarily reducing light penetration. Conditions would return to preconstruction levels after completion of the proposed project. Construction activities to close the 1,500-foot gap in the Frontline Levee would be conducted during low water or dry periods, thus would have no effect on light penetration.

(b) Dissolved oxygen (DO). Deposition of excavated material into the wetlands or the waterways would not significantly affect DO levels. The re-suspension of reduced sediments may temporarily lower dissolved oxygen concentrations, but no long-term adverse effects would be anticipated.

(c) Toxic metals and organics. No significant long term impacts would be anticipated.

(d) Pathogens. There are no known pathogen problems in any of the waterways, thus no effect on pathogens would be expected.

(e) Aesthetics. No appreciable changes in aesthetics of the water column would be expected.

(f) Others as Appropriate. None expected.

(3) Effects on Biota.

(a) Primary production, photosynthesis. Excavation of the fill material would remove biota within the excavated areas, and placement of the material would cover any existing biota within the disposal sites. A minor setback in primary production would take place until vegetation reestablishes.

(b) Suspension/filter feeders. Excavation of the fill material would remove biota within the excavated areas. Based on the number and diversity of mussels reported in a 2010 survey for this project, it is expected that re-colonization would eventually take place, provided channel cleanouts are not frequent.

(c) Sight feeders. Noise and disturbance of project-related equipment would displace most fisheries and avian sight-feeders during construction. Habitat suitability would be temporarily reduced in the excavated reaches. After construction, fish and avian species would return to the areas and invertebrates would re-colonize the substrate.

(4) Actions Taken To Minimize Impacts. Alternative 3.1 incorporates actions to avoid and minimize impacts. Among these are reducing channel work in streams and ditches, reducing wooded wetlands impacts, and maintaining a level of connectivity between the Mississippi River and the New Madrid Floodway. Additional information can be found in Section 4 of the draft EIS.

d. Contaminant Determinations. The discharge of excavated material is not expected to introduce, translocate, or increase any contaminant.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton. Due to the location of the project area, impacts to plankton are not applicable.

(2) Effects on Benthos. Excavation for channel enlargement would remove biota within the excavated areas. No long term changes to benthos are anticipated. Additional information can be found in Section 4 of the draft EIS.

(3) Effects on Nekton. The nekton community of the project area consists primarily of fishes. Project impacts have been assessed based on various ecological models. In summary the project (without compensatory mitigation) would impact fish spawning and rearing habitat. Impacts to project area fishes can be found in Section 4 of the draft EIS.

(4) Effects on the Aquatic Food Web. Project impacts have been assessed based on various ecological models. In summary the project (without compensatory mitigation) would impact fish spawning and rearing habitat, winter waterfowl habitat, and spring/fall shorebird habitat. These effects are detailed in Section 4 of the draft EIS.

(5) Effects on Special Aquatic Sites.

(a) Sanctuaries and Refuges. There are no known sanctuaries or refuges within the project area.

(b) Wetlands. A combined total of approximately 418 acres of vegetated wetlands in the St. Johns Bayou Basin and New Madrid Floodway would be directly impacted by the project. Closing the New Madrid Floodway gap and operating pumping stations would indirectly impact wetlands. These impacts are discussed in Section 4 of the draft EIS. With mitigation, post-project vegetated wetland acres are expected to increase by roughly 2,351 acres in the St. Johns Bayou Basin, by 4,160 acres in the New Madrid Floodway, and 3,050 acres in the batture area.

(c) Mud Flats. Mud flats are not known to exist within the project area.

(d) Vegetated Shallows. Vegetated shallows are permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation, such as turtle grass and eelgrass in estuarine or marine systems, as well as a number of freshwater species in rivers and lakes. There are no known vegetative shallows in the project area.

(e) Coral Reefs. There are no coral reefs in the project area.

(f) Riffle and Pool Complexes. Riffle and pool complexes have not been identified within the project area. The typical agricultural ditch within the project area consists of a straight, trapezoidal channel with a relatively flat, uniform bed devoid of substantial bar structures.

(6) Threatened and Endangered Species. Consultation with the U.S. Fish and Wildlife Service (USFWS) is on-going.

(7) Other Wildlife. Impacts to terrestrial wildlife, including qualitative assessments to reptiles and amphibians are described in Section 4.0 of the draft EIS.

(8) Actions to Minimize Impacts. Alternative 3.1 incorporates actions to avoid and minimize impacts. Among these are reducing channel work in streams and ditches, reducing vegetated wetlands impacts, and maintaining a level of connectivity between the Mississippi River and the New Madrid Floodway as detailed in Section 4 of the draft EIS.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination. The mixing zone is not anticipated to exceed criteria outlined in the State of Missouri water quality standards (10 CSR 20-7.031).

(2) Determination of Compliance with Applicable Water Quality Standards. The analysis conducted by Soballe and Ashby (2012) concluded that the effects of the proposed project on Mississippi River water quality would not be discernible. This was based on several lines of evidence; including (1) the ratio of project outflow volume to Mississippi River flow volume (< 1 percent), (2) the finding that the project would reduce the material load from the project area to the river relative to the existing condition, and (3) the finding that the project area would likely exhibit a net retention and processing of material that enters it from the Mississippi River, although this could be a small net loss of retention relative to the existing condition (See draft EIS, Section 4.0). Water quality certification would be obtained from Missouri prior to project construction.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and private water supply. The ditches and bayous in the project area are not currently used as a municipal water supply, nor are they expected to be used as such; therefore, effects on municipal and private water supplies are not anticipated.

(b) Recreational and commercial fisheries. No substantial commercial fishing takes place in the St. Johns Bayou Basin or New Madrid Floodway. Recreational fishing in streams and ditches is minimal due to low flows in most ditches. Closing the New Madrid Floodway gap is not expected to greatly impact fish species that use streams and ditches there, since the proposed Mud Ditch outlet structure would remain open for most of the year and because it is reasonable to expect that fish will navigate the structure.

(c) Water-related recreation. Other than fishing, aquatic recreation is essentially nonexistent within the study area. There are no recreational or commercial fisheries whose suitability for that use will be impacted by the project. Very little sight-seeing or canoeing occur in the area outside existing recreational areas and no negative impact to those areas are expected post-project. Excavated and fill material would not be placed in or near recreational areas such as Big Oak Tree State Park or Tenmile Pond nor would they hinder any recreational activities.

(d) Aesthetics. Construction activities would temporarily affect existing viewshed in the project area. Placement of fill material would cover vegetation with less aesthetically pleasing earthen material. These areas would be allowed to naturally re-vegetate and eventually would likely exceed pre-construction aesthetic values.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar preserves. None found within the project construction rights-of-way (ROW). However, through compensatory mitigation, alternative 3.1 would restore hydrology to Big Oak Tree State Park, which has been designated a National Natural Landmark by the National Park Service, a Missouri Natural Area by the State of Missouri, and contains a number of current and past state and national champion trees by American Forests, a nonprofit conservation organization.

(g) Determination of Cumulative Effects on the Aquatic Ecosystem. Forest once covered 93% of the project area (Heitmeyer 2010). When comparing historic vegetation communities/habitat types to current conditions, the project area has already been drastically changed due to land clearing and farming operations and due to construction of levees and drainage systems for agricultural purposes. Despite the extent of these impacts, the project area has restoration potential that could be achieved through proposed mitigation measures (see draft EIS, Section 4.0). No further land clearing is expected after the project is completed and with mitigation, there will be more vegetated areas in the aquatic ecosystem than if the project is never implemented.

(h) Determination of Secondary Effects on the Aquatic Ecosystem. The proposed project would indirectly affect approximately 6,678 acres and 9,572 acres of vegetated wetlands lying within the 5-year floodplain (without the proposed project) in the St. Johns Bayou Basin and New Madrid Floodway, respectively. In addition, there would be indirect impacts to the 792 acres and 306 acres of farmed wetlands in the St. Johns Bayou Basin and New Madrid Floodway, respectively. Alternative 3.1 minimizes indirect impacts by incorporating water management options that would maintain connectivity between the Mississippi River and wetlands in the New Madrid Floodway. Compensatory mitigation is based on impacted wetlands functions, expressed as FCU, not on acreage. Tables 3 and 4 illustrate mitigation necessary to compensate for unavoidable impacts to wetlands for alternative 3.1.

Table 3. St. Johns Bayou Basin impacts and mitigation necessary to compensate for impacts. Mitigation assumes small tracts of LGRB.

	Impacts (FCU)		Mitigation (acres)	
Function	LGRB	LGRO	LGRB	LGRO
Detain Flood Water	-116	-397	**201**	**623**
Detain Precipitation	0	-307	0	340
Cycle Nutrients	0	-344	0	552
Export Organic Carbon	-115	-319	164	519
Maintain Plant Communities	-50	-374	67	573
Provide Fish and Wildlife Habitat	0	-210	0	476

Table 4. New Madrid Floodway impacts and mitigation necessary to compensate for impacts. Mitigation assumes large tracts of LGRB.

	Losses in FCU			Gains in FCU		Mitigation (acres)		
Function	LGRB	LGRO	CD	Flats	UCD	LGRB	LGRO	CD
Detain Flood Water	-3,487	-35	-97	NA	NA	**5,828**	55	161
Detain Precipitation	-2,423	0	0	1,910	NA	2,619	0	NA
Cycle Nutrients	-2,092	0	-94	2,088	110	2,899	0	141
Export Organic Carbon	-3,558	-35	-118	NA	NA	4,929	**57**	182
Maintain Plant Communities	-2,582	-35	-124	2,183	113	3,511	52	**215**
Provide Fish and Wildlife Habitat	-1,970	-12	-89	1,616	71	3,356	26	152

A total of 6,924 acres of wetlands mitigation may be needed to comply with the Clean Water Act.

It is estimated that 2,724 acres and 8,406 acres of wetlands would be restored in the St. Johns Bayou Basin and New Madrid Floodway, respectively, were alternative 3.1 selected. As illustrated in Tables 5 and 6, the functional value of wetlands will increase under alternative 3.1. A summary of wetland compensation benefits associated with several mitigation methods is provided in Section 6 of the draft EIS.

Table 5. Alternative 3.1 compensatory mitigation zone gains to wetlands expressed as FCU in St. Johns Bayou Basin.

Mitigation Zone	HGM Subclass	Acres	Detain Floodwater	Detain Precipitation	Cycle Nutrients	Export Organic Carbon	Maintain Plant Communities	Fish & Wildlife Habitat
BLH Restoration <285'	LGRB	400	232	372	288	280	300	108
BLH Restoration <5-year	LGRB/LGRO[1]	1193/623	690/396	638/562	859/450	835/437	891/467	315/373
Riparian Buffer Strips (Woody)	LGRO	70	44	63	43	43	46	31
Riparian Buffer Strips (Grass)	LGRO	N/C	N/C	N/C	N/C	N/C	N/C	N/C
Ecologically Designed Borrow pits	CD[2]	194	37	N/A	81	76	29	29
Seasonally Inundated Farmland		244	N/C	N/C	N/C	N/C	N/C	N/C

[1]Depending on location, mitigation could be LGRO or LGRB. However for the purpose of this table, 623 acres were assumed to be LGRO. Regardless, a minimum of 397 LGRO FCU is required to compensate for impacts to jurisdictional wetlands.
[2]Borrow pits would be designed so that half of each pit would have an average depth of less than three feet. Wetland vegetation is expected. 387 acres are proposed. Therefore, 194 acres of wetland functions would be provided.
N/A – not applicable
N/C – not calculated but would be calculated during the completion of site specific detailed mitigation plans, if applicable and necessary.

Table 6. Alternative 3.1 compensatory mitigation zone gains to wetlands expressed as FCU in the New Madrid Floodway.

Mitigation Zone	HGM Subclass	Acres	Detain Floodwater	Detain Precipitation	Cycle Nutrients	Export Organic Carbon	Maintain Plant Communities	Fish & Wildlife Habitat
Big Oak Tree State Park	LGRB	976	966	976	869	1044	957	761
Big Oak Tree State Park	CD	49	41	NA	33	41	48	35
Big Oak Tree State Park Surrounding Land	LGRB	1,800	1076	1665	1300	1300	1366	1078
BLH Restoration <285'	LGRB	387	232	360	279	279	286	228
BLH Restoration <5-year	LGRB	1,970	1,182	1,832	1,418	1,418	1,457	1,162
Batture Land Reforestation	LGRB	2,800	1,952	1,769	2,592	1,860	2,043	1,403
Batture Land Reforestation	LGRO	250	159	226	156	154	167	111
Ecologically Designed Borrow pits	CD[2]	30	6	N/A	20	20	17	18
Seasonally Inundated Farmland	tbd	1,286	N/C-tbd	N/C-tbd	N/C-tbd	N/C-tbd	N/C-tbd	N/C-tbd
Ten Mile Pond CA	tbd	1,917	N/C - tbd	N/C-tbd	N/C-tbd	N/C-tbd	N/C-tbd	N/C-tbd
Floodplain Lake Restoration	CD[3]	144	84	N/A	96	91	91	87

[1] Impacts are combined by summing across all agricultural lands, forested areas, and future WRP sites as well as LGRB, LGRO, CD, and UCD wetland types. Note there were impacts and gains to some categories. The value in the table is the sum of all categories. [2]Borrow pits would be designed so that half of each pit would have an average depth of less than three feet. Wetland vegetation is expected. 60 acres are proposed. Therefore, 30 acres of wetland functions would be mitigated. [3]Similar to borrow pits, it is assumed that one third of restored floodplain lakes would have an average depth of less than three feet. Wetland vegetation is expected. 432 acres of floodplain lakes are anticipated. Therefore, 144 acres of CD are expected.

N/A – not applicable, N/C – not calculated, tbd – to be determined during the development of site specific detailed mitigation plans.

III. Findings of Compliance for the Proposed Project

1. No substantial adaptations to the Guidelines, 40 C.F.R. part 230, were made for purposes of this evaluation, as per Engineer Regulation 1105-2-100, Appendix C.

2. Eight alternatives were carried forward for detailed analysis in the draft EIS. This range of alternatives, as described in Section 2 of the draft EIS, is the starting point for USACE's practicability analysis under the Guidelines. The alternatives are evaluated to determine which are practicable, and of those which is the least environmentally damaging. 40 C.F.R. § 230.10(a) states that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. A practicable alternative, as defined in 40 C.F.R. § 230.10 (a)(2), is one that is "available and capable of being done after taking into consideration cost, existing technology, and logistics, in light of overall project purposes." Alternatives that do not meet the purposes of the proposed project are not practicable. Additionally, the Guidelines presume that practicable alternatives are available for projects that do not involve special aquatic sites, but do not presume that practicable alternatives are available for projects that are water dependent.

The statutory authorizations for and the objectives of the proposed project, as enumerated in Section 1 of the draft EIS, comprise the fundamental, essential or irreducible, i.e., basic, purpose of the proposed project, and are used to determine whether the project is water dependent under the Guidelines. A project is water dependent if it requires access or proximity to or siting within a special aquatic site to fulfill its basic purpose. The basic project purpose for the St. Johns Bayou-New Madrid Floodway project is to improve the means and methods of preventing and controlling destructive floodwaters in the project area. Both the St. Johns Bayou Basin and the New Madrid Floodway contain special aquatic sites, including wetlands and other areas defined in 40 C.F.R. part 230, subpart E, which the proposed project will likely affect.

The flood risk reduction improvements proposed to be constructed in St. Johns Bayou Basin and in the New Madrid Floodway must, in order to serve their intended purposes, achieve project objectives, and satisfy legal and policy requirements, be placed in proximity to, or be sited within, special aquatic sites, and the reasonably foreseeable impacts of the proposed project will unavoidably affect special aquatic sites. Section 2 of the draft EIS explains that no practicable alternatives were identified that would not impact special aquatic sites directly or indirectly. While alternatives such as relocations, buy-outs, ring levees, and conversion to flood tolerant crops were considered, none of those alternatives were shown to be reasonable and feasible, or practicable.

This practicability determination is not based on whether the cost of the proposed project is substantially greater than the cost normally associated with other similar projects. Rather practicability in this case is based on a benefit-to-cost ratio, much in the same way that profitability is determined for commercial development. USACE regulations that require all flood risk management civil works projects have a minimum benefit-to-cost ratio of 1.0, without which a project cannot be recommended for construction.

As approved by Congress, the overall purpose of the St. Johns Bayou-New Madrid Floodway project is to reduce the likelihood and adverse effects—on agricultural and urban lands—of backwater and headwater flooding in both the New Madrid Floodway and in the St. Johns Bayou Basin. The project purpose thus requires reduction of flood risk and flood damage in both basins. Accordingly, single-basin-only alternatives (Alternatives 2.1 and 2.2) are not practicable; they satisfy only a portion of the proposed project's purpose.

As described in Section 2 of the draft EIS, alternatives that did not have the required positive benefit-to-cost ratio were not carried forward for analysis. All of these were not practicable in terms of cost. Technology, however, was not a limiting factor. All alternatives were capable of being accomplished without technological constraints.

Logistics, on the other hand, expressed in terms of the availability of suitable mitigation land, was a limiting factor in the case of one alternative. Alternative 4.2 is not reasonably likely to be successful because it is not realistic to expect that 13,340 acres can be acquired in the New Madrid Floodway below the 289.5-foot elevation.

All other alternatives are considered practicable, but none of the four are clearly the least environmentally damaging. All of these alternatives appear to be mitigable to below the threshold of significance. Alternative 2.3 has the most impacts on LGRB, LGRO and CD wetlands. Alternative 4.1 has the fewest impacts on LGRB and CD wetlands, while Alternative 3.1 has the fewest impacts on LGRO wetlands.

Alternative 3.1, the TSP, is demonstrably the most practicable in light of all relevant factors. It avoids and minimizes impacts, provides adequate compensatory mitigation, and produces the greatest national economic benefit. A summary of the practicability criteria is summarized in Table 7.

Table 7. Practicability Analysis of Alternatives 2.3, 3.1., 3.2, 4.1, and 4.2.

Practicability Criteria	Alternative 2.3	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Project purpose (total acres reduced flooding)	55,193	46,248	48,145	41,883	41,883
average day roads are innudated	17.4 SJB/0 NMF	11.9 SJB/0 NMF	11.9 SJB/0 NMF	11.9 SJB/0.2 NMF	11.9 SJB/ 0.2 NMF
meets project purposes	yes	yes	yes	yes	yes
Cost criteria					
total first costs ($000s)	200,616	164,779	178,429	151,357	179,619
excess annual benefits	7,101	8,252	8,125	8,228	6,367
differences compared to TSP	1,151	0	127	24	1,885
meets cost criteria	yes	yes	yes	yes	yes
Availability/logistics criteria					
acres of non-mitigation acquisition	0	0	0	0	reforest 13,340 acres below 289.5
meets logistics criteria	yes	yes	yes	yes	no
environmental criteria					
wetlands impacts LGRB detain floodwater FCU	-6,565	-3,598	-4156	-3,024	-75
wetlands impacts CD maintain plant communities FCU	-839	-432	-432	-583	-583
wetlands impacts CD maintain plant communities FCU	-179	-124	-138	-108	-196
overall practicability determination	yes	yes	yes	yes	no

3. A request for state water quality certification would be submitted to the Missouri Department of Natural Resources for the planned action.

4. The Toxic Effluent Standards of section 307 of the Clean Water Act would not be triggered.

5. Consultation with USFWS, regarding the endangered Internal Least Tern, is on-going. Additional measures may be taken according to any Biological Opinion issued by USFWS.

6. The proposed disposal of dredged material would not likely result in significant adverse effects on human health or welfare, municipal or private water supplies, recreational or commercial fishing, plankton, fish, shellfish, wildlife, or special aquatic sites. Further, in light of proposed mitigation, significant adverse effects would not likely occur to aquatic ecosystem diversity, to productivity and stability, or to recreational, aesthetic, and economic values. And finally, no other adverse environmental consequences are foreseeable, were alternative 3.1 selected. Additional information on impacts can be found in Section 4 of the draft EIS.

7. The proposed disposal sites for the discharge of dredged material comply with the requirements to include appropriate and practical conditions to minimize pollution and adverse effects on the aquatic ecosystem.

IV. Evaluation Responsibility

a. Water Quality Input Prepared by: Joshua M. Koontz

b. Project Description and Biological Input Prepared by: Joshua M. Koontz

_____ _____

Date

Edward P. Lambert
Chief, Environmental Compliance Branch
Regional Planning and Environmental Division South

Literature Cited

Castle, A.J., A.W. Johnson and C. Conolly. 1994. Wetland and stream buffer size requirements – a review. J. Environ. Qual. 23: 878-882.

Dahl, T.E. and G. J. Allord. 1997. Technical aspects of wetlands: History of wetlands in the conterminous United States. National Water Summary – Wetland Resources: Technical Aspects. United States Geological Survey, Water Supply Paper 2425.

Heitmeyer, M.E. 2010. An assessment of historic land cover for the St. Johns Bayou Basin New Madrid Floodway Region. Report Prepared for U.S. Army Corps of Engineers, Memphis District, Memphis, TN. Greenbrier Wetland Services Report 10-05. Advance, Missouri. 56 pp.

Lyons, J., S.W. Trimble and L.K. Paine. 2000. Grass versus trees: managing riparian areas to benefit streams of central North America. Journal of the American Water Resources Association 36: 919-930.

Robertson, D.M., G.E. Schwarz, D.A. Saad, and R.B. Alexander. 2009. Incorporating uncertainty into the ranking of SPARROW model nutrient yields from Mississippi/Atchafalaya river basin watersheds. Journal of the American Water Resources Association 45: 534 – 549.

Wolf, D.D. 2009. Planting and managing switchgrass for forage, wildlife, and conservation. Virginia Cooperative Extension, Virginia Tech and Virginia State University. http://pubs.ext.vt.edu/418/418-013/418-013.html